

2023 Scenathon results

Pathways for food  
and land-use systems  
in Argentina



**FABLE**  
CONSORTIUM



### **About FABLE**

The Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium is a collaborative initiative to support the development of globally consistent mid-century national food and land-use pathways that could inform policies towards greater sustainability. The Consortium brings together teams of researchers from 24 countries and international partners from the UN Sustainable Development Solutions Network (SDSN), the International Institute for Applied Systems Analysis (IIASA), the Alliance of Bioversity International and CIAT, and the Potsdam Institute for Climate Impact Research (PIK). <https://www.fableconsortium.org/>

### **About the authors**

The pathways for food and land-use systems in Argentina were developed by Federico Frank (National Agricultural Technology Institute - [frank.federico@inta.gob.ar](mailto:frank.federico@inta.gob.ar)), Adrian Monjeau (Fundación Bariloche), Camila Bertranou (Fundación Bariloche).

### **Recommended citation**

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Our food and land-use systems are critical for staying within our planetary boundaries and the Earth’s system resilience. Among the [six Transformations](#) required to achieve the Sustainable Development Goals (SDGs), the fourth Transformation—focusing on food, land, and water—is crucial. This Transformation is key to achieving SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land). Moreover, it significantly supports the remaining SDGs, underscoring its crucial role in fostering a sustainable future.

In this document, we present the results of the 2023 ‘Scenathon’, a modelling exercise by the FABLE Consortium exploring three alternative futures for national and regional food and land-use systems. The term ‘[Scenathon](#)’ stands for ‘a marathon of scenarios’ and refers to FABLE’s iterative process for ensuring that national and regional pathways have coherent trade assumptions and align with global sustainability targets (see the [2024 Sustainable Development Report](#) for more information).

Through these long-term pathways, we can identify trade-offs and synergies between different goals and see the impact of various actions, as well as key levers for guiding sustainable development policies through 2030 and 2050. These results, together with our modelling tools and methods, are designed to support decision-making and the development of better policies and targets to drive the transformation of our food and land-use systems.

Figure 1. Historical share of GHG emissions from Agriculture, Forestry, and Other Land Use (AFOLU) to total AFOLU emissions and removals by source in 2012

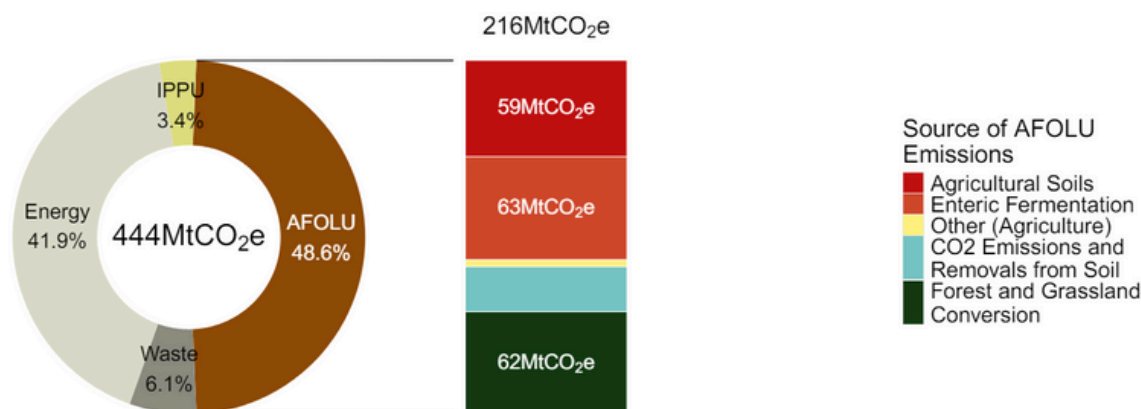
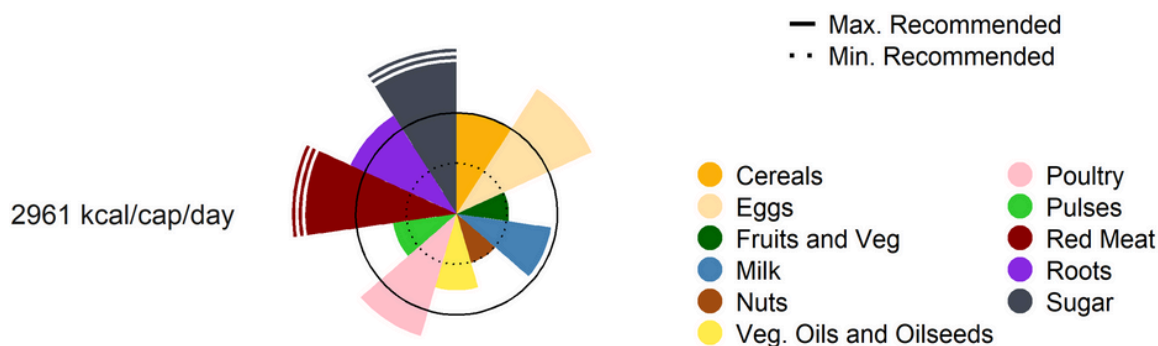






Figure 2. Daily average kilocalorie intake per capital per food category in 2020



This table summarizes national targets for food and land use, derived from national commitments, policies, and strategies. It provides an overview of the country's current ambitions to transform its food and land-use systems. Where countries lacked quantitative national targets, we have estimated targets based on qualitative pledges.

SDG	Indicator	National Target (OS) Official source, (A) Assumption by the team.
 2 ZERO HUNGER	Self sufficiency	Increase livestock productivity by expanding "MBGI" (Forest Management with Integrated Livestock) to 1 million ha of forests. Increase in the area with crops with higher adaptation to climate change up to 3 M ha by 2030 (OS).
	Undernourishment	Ensuring food security for all. (OS)
 13 CLIMATE ACTION	Agriculture GHG emissions reduction	Carbon neutrality by 2050 (AFOLU sector). (OS)
	Land use and land use change GHG emissions reduction	Reducing emissions from LU and LUC by 50 Mt by 2030. (OS)
	Reduce or halt deforestation	No deforestation beyond 2030 (OS)
	Other climate mitigation related targets	20% of gasoline and diesel coming from biofuels. Reduce Forest fires and enhance the Forests monitoring system (OS)
 15 LIFE ON LAND	Promote afforestation	Increase afforested areas by 2% by 2030 (Adaptation and Mitigation Plan). Also 1 M ha afforestation pledge in Bonn Challenge. (OS)
	Expand protected areas or 'Other effective area-based conservation measures' (OECMs)	30% of terrestrial areas will be protected by 2030. Increase restoration of degraded ecosystems (OS)
	Expand cropland area under agroecological practices	Expand agroecological practices to 15 million ha by 2030 (OS)
	Reduce or halt use of agrochemicals and other agricultural practices that harm biodiversity	Increase area under precision agriculture, reducing pesticides and fertilizers use (from 3,8 to 10% by 2030) (OS)
 8 DECENT WORK AND ECONOMIC GROWTH	Agricultural exports	Increase livestock exports (double those of 2020 by 2030). Increase fish exports by 70% in 2030. Increase fruits and vegetables (50%), milk (15%), legumes (49%) exports (A).
	Timber exports	Increase timber exports from 15 to 20 million m3 (2020-2030) and increase plantations area by 53% (OS)

## Model

Using the open-access [FABLE Calculator](#) and the FABLE decentralized modelling infrastructure, we have developed three alternative pathways —Current Trends, National Commitments, and Sustainable Pathway— to explore the impact of various practices and policies on achieving sustainability targets through 2050. We compare our results with targets across food security and nutrition, GHG emissions reduction, forest and biodiversity conservation, and sustainable use of water, nitrogen, and phosphorus.

For each of these pathways, we have established various assumptions regarding the evolution of several model parameters. These parameters include population growth, dietary patterns, food waste, food import and export levels, crop and livestock productivity, agricultural expansion, afforestation, livestock density, protected areas expansion, post-harvest losses, biofuel demand, urban expansion, agricultural practice coverage, and irrigation area expansion. These assumptions detail the extent to which these factors will drive changes in food and land systems from 2020 to 2050.

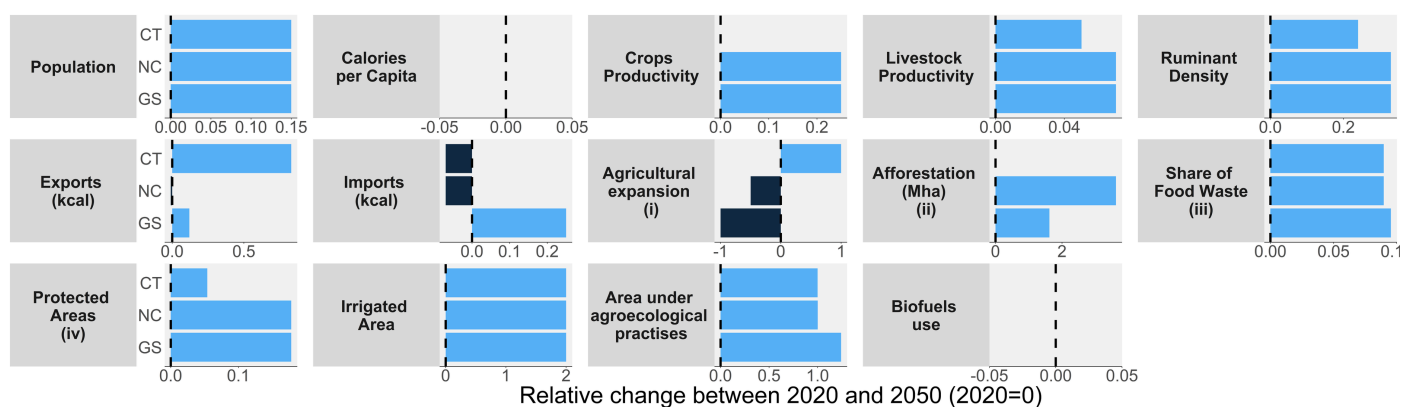
## Pathway narratives

**Current Trends:** Under this pathway, we assume that stakeholders do not influence policymakers and there will be no radical change in the coming years. This is currently the most likely option due to lack of funding (including from Global North sources) and lack of political will.

**National Commitments:** We assume that political decisions and investments are aligned with national commitments to address the proposed challenges. This pathway depends heavily on external funds and processes such as “debt for nature swap”.

**Global Sustainability:** National actions/policies significantly contribute to global sustainability targets. This pathway depends also on external funds and processes such as “debt for nature swap”, but reduces the importance of national targets as compared to global ones.

Figure 3. Assumptions on the levers for change in each pathway



**Notes:** (i) Results are expressed in code, taking the value 1 for 'Free expansion scenario', -0.5 for 'No deforestation' and -1 for 'No Agricultural expansion'.  
(ii) Results are expressed in a net increase rather than relative change.  
(iii) Results are expressed % of consumption that is wasted.  
(iv) Results are expressed in % of total land in 2050.

Figure 4. Computed daily average intake per capita over 2000-2050

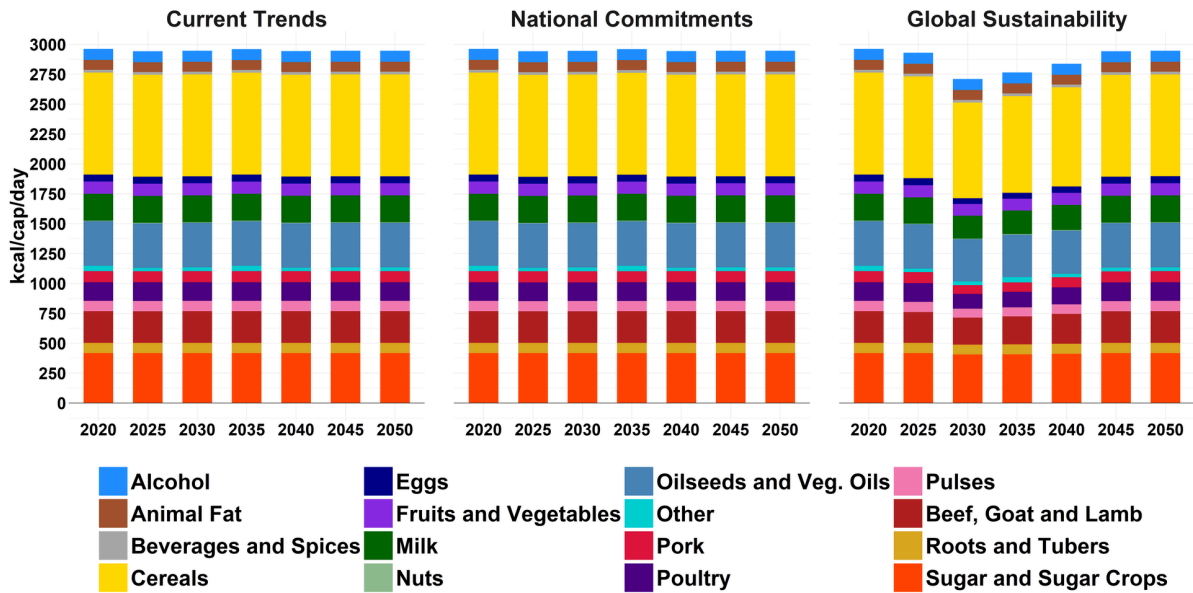


Figure 5. Comparison of the computed daily average kilocalorie intake per capital per food category across the three pathways and the prevalence of undernourishment in 2050

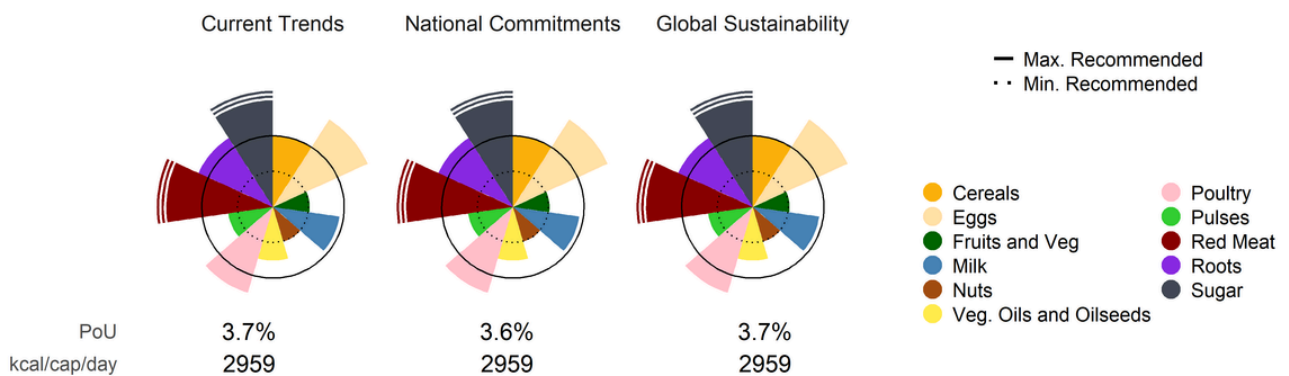


Figure 6. Evolution of land cover 2000-2050

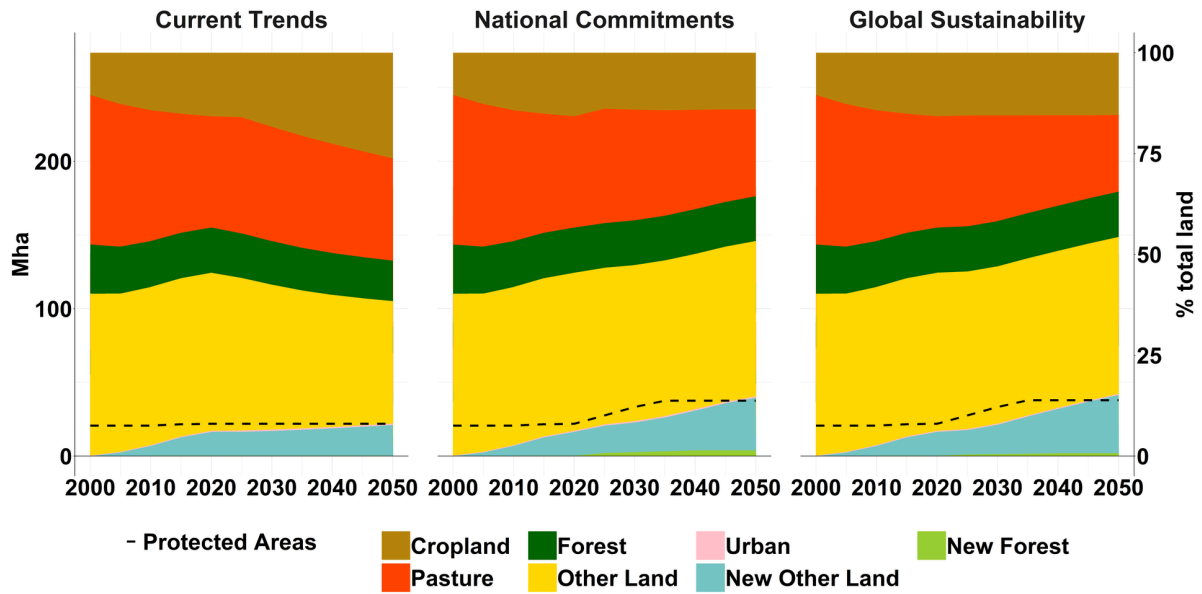


Figure 7. Evolution of the cropland composition 2000-2050

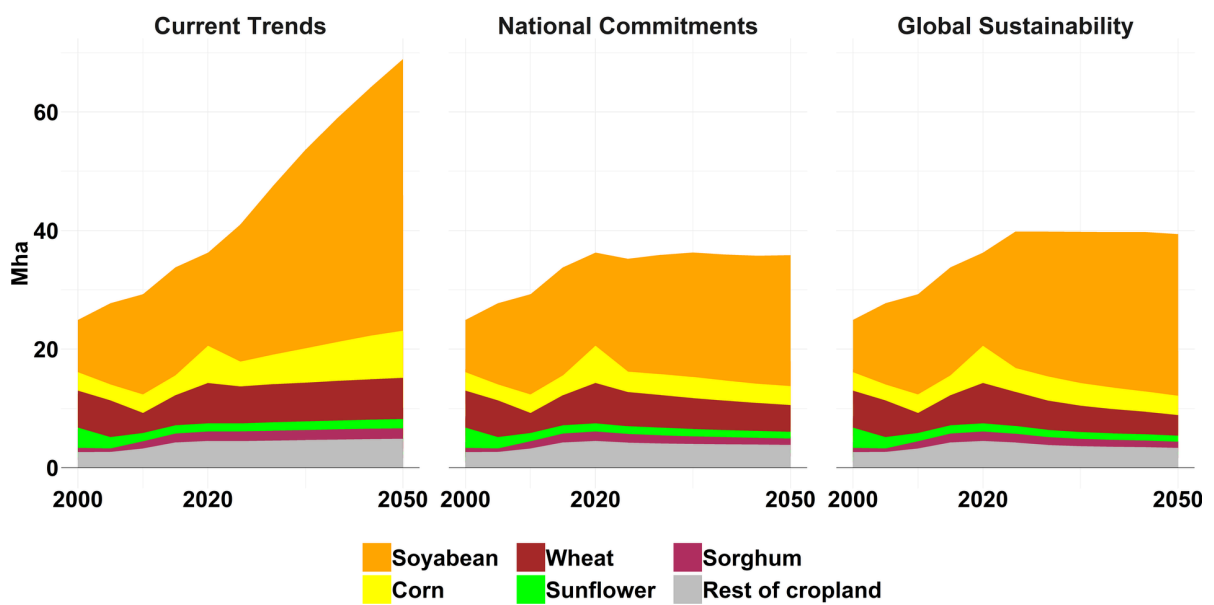


Figure 8. Projected AFOLU emissions and removals between 2020 and 2050 by main sources and sinks across pathways

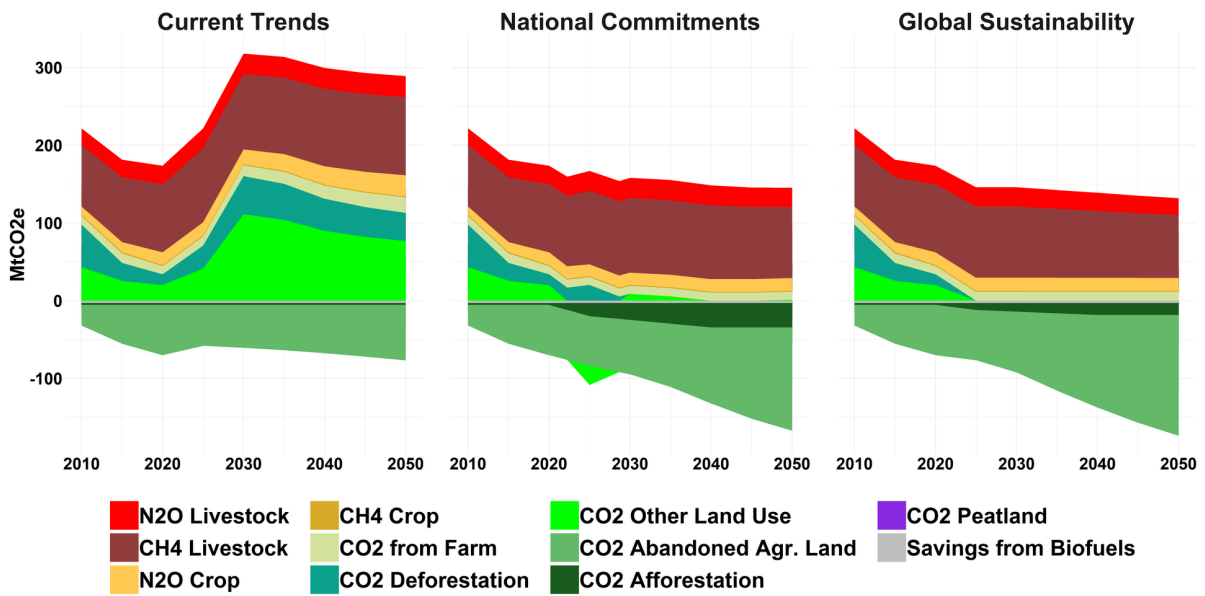


Figure 9. Share of cropland under agroecological practices

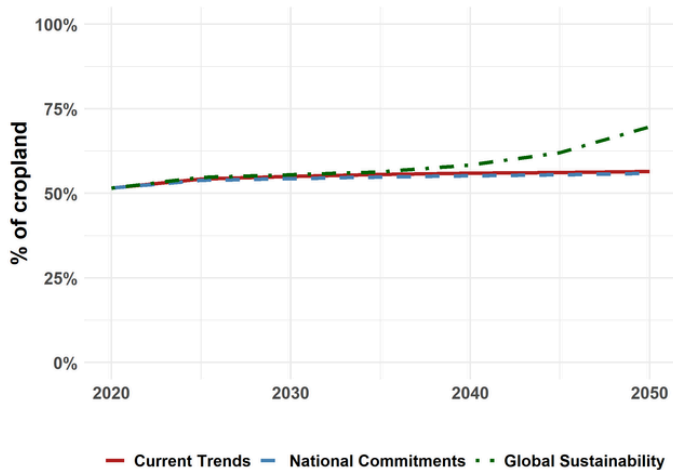


Figure 10. Total area of land where natural processes predominate (LNPP)

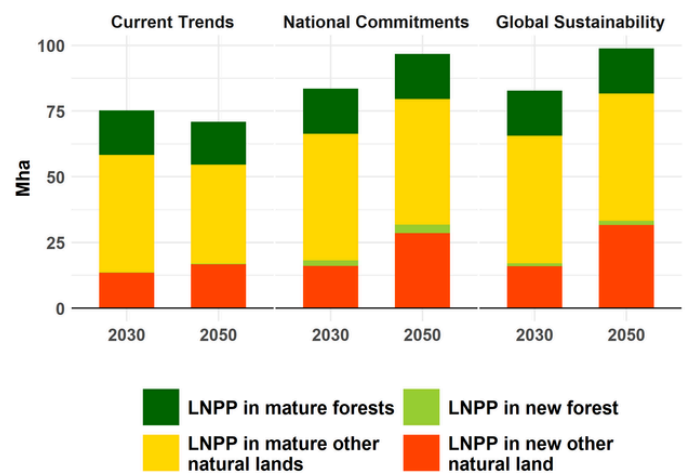




Figure 11. Nitrogen application

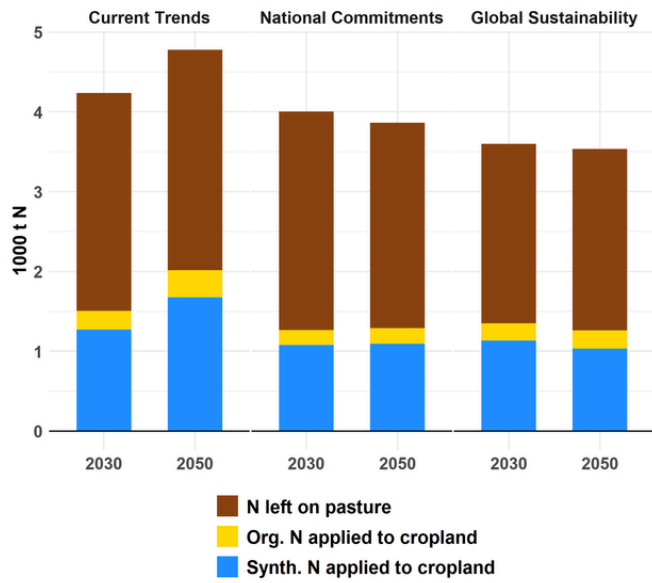
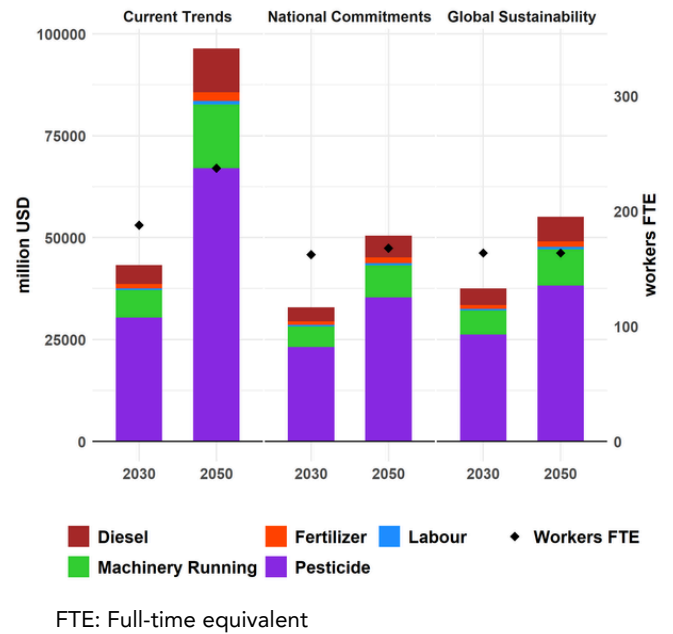


Figure 12. On-farm production costs



For more detailed results and visual data, visit [www.scenathon.org](http://www.scenathon.org)

# Scenarios and assumptions

		<b>A) CURRENT TRENDS</b>	<b>B) NATIONAL COMMITMENTS</b>	<b>C) GLOBAL SUSTAINABILITY</b>	<b>Justification</b>
<b>1. Macroeconomics</b>	<b>1.1)</b> GDP per capita	We selected SSP2 because it is literally "middle of the road". GDP p/c by 2050 reaching 12,850 USD.	same as CT.	same as CT.	-
	<b>1.2)</b> Population	We selected UN_Medium variant, which projects around 50 million people by 2050	same as CT.	same as CT.	<a href="#">UNData for Argentina.</a>
	<b>1.3)</b> Inflation	Local inflation is a mess in Argentina. We currently have more than 100% per year and it has been more than 30% in the past ten years. No analysis can be done in pesos, so we rely on USD values. Prices in USD are somewhat constant through the period 2000-2020, and we expect them to remain this way.	same as CT.	same as CT.	-
	<b>1.4)</b> Inequalities	We assumed inequalities will remain the same, regarding social status, gender, age, etc.	Inequalities in food access are minimized by 2030.	Same as CT.	The <a href="#">National Food Security Plan</a> (for National Commitments).
<b>2. Land</b>	<b>2.1)</b> Constraints on agricultural expansion/deforestation	No constraint on the expansion of the agricultural land beyond protected areas and some areas of forest. Every province must determine which forest areas are allowed to be deforested, both in extent and location, but the emphasis is on the location, so this can't be included as a restriction.	Given there are restrictions, we selected no deforestation beyond 2030.	Same as NC.	For NC and GS see the <a href="#">National Adaptation and Mitigation to Climate Change Plan.</a>

# Scenarios and assumptions

		<b>A) CURRENT TRENDS</b>	<b>B) NATIONAL COMMITMENTS</b>	<b>C) GLOBAL SUSTAINABILITY</b>	<b>Justification</b>
	<b>2.2)</b> Afforestation, and forest plantations targets	No afforestation or forest plantation targets, currently around 1,1 million ha. Forest plantations increased around 30,000 ha per year in the past 20 years, and this would result in around 2 million ha by 2050.	We produced a new Scenario called BonnChallenge+ to include all the afforestation and plantation targets and include the carbon neutrality by 2050 target (afforestation identified as a way to achieve it).	Same as NC.	For NC and GS see the <a href="#">National Environmental and Climate Change Plan</a> , the <a href="#">Forests and CC Plan</a> , the <a href="#">Plantations and Sustainability</a> document and <a href="#">Bonn Challenge Website</a> .
	<b>2.3)</b> Urban and settlements area	It is assumed that the area will increase proportionally with population increase (no change in density) and no change in urban/rural ratio (90% urban). This means the area will reach 0.9 million ha in 2050 (currently around 0.7).	same as CT.	same as CT.	-
	<b>2.4)</b> Protected areas	No change in protected areas (15% of land area still remaining by 2050).	We selected PA Expansion because the final value is close to the 30% pledge.	Same as NC.	Reference: <a href="#">Federal System of Protected Areas</a> . For NC and GS see the <a href="#">Convention on Biological Diversity</a> .
<b>3. Productivity and management</b>	<b>3.1)</b> Crop productivity for the key crops	BAU Growth for main crops. The 2000-2020 growth is projected until 2050.	Increased productivity for key crops (to meet the increase in export ambition). Increase in the area with crops with higher adaptation to climate change up to 3 M ha by 2030.	Increased productivity for key crops (to spare land while maintaining total production).	References: <a href="#">Productive Argentina 2030</a> and <a href="#">National Environmental and Climate Change Plan</a> .

# Scenarios and assumptions

		<b>A) CURRENT TRENDS</b>	<b>B) NATIONAL COMMITMENTS</b>	<b>C) GLOBAL SUSTAINABILITY</b>	<b>Justification</b>
	<b>3.2)</b> Cropland under agroecological practices	No increase in agroecological practices area.	We assume that Middle Growth can be reached by expanding agroecological practices to 15 million ha by 2030 (10% of farmers and 20% of municipalities) and increasing in 1% the number of livestock farmers that apply agroecological practices.	In order to reduce land use change to a minimum, high growth is needed to maintain production.	
	<b>3.3)</b> Livestock productivity for the key livestock products	BAU Growth for livestock productivity (2000-2020).	In order to reduce land use change to a minimum, high growth is needed to maintain production.	In order to reduce land use change to a minimum, high growth is needed to maintain production.	For NC and GS see <a href="#">Productive Argentina 2030</a> .
	<b>3.4)</b> Pasture stocking rate	BAU Growth for livestock stocking rate (2000-2020).	Increase in livestock productivity changes in around 1 million ha of forests via "MBGI" (Forest Management with Integrated Livestock).	Same as NC.	For NC and GS see <a href="#">Productive Argentina 2030</a> . And the <a href="#">MBGI Plan</a> .
	<b>3.5)</b> Forest management	No changes.	Improving forest management techniques, especially regarding livestock in forests.	Improving forest management techniques, especially regarding livestock in forests.	Reference: <a href="#">Strategic Forestry Plan</a> .
<b>4. Trade</b>	<b>4.1)</b> Share of consumption which is imported for key imported products (%)	Reduced imports, to account for BAU.	Reduced imports, due to plans to export more, produce more, and be self-sufficient.	Increased imports, to promote land sparing.	-
	<b>4.2)</b> Evolution of exports for key exported products (1000 tons)	We selected the minimum increase in exports available to account for BAU tendency (slow increase in exports in the 2000-2020 period).	Exports are tripled by 2050 to account for above mentioned national strategies and plans.	Same as CT.	-

# Scenarios and assumptions

		<b>A) CURRENT TRENDS</b>	<b>B) NATIONAL COMMITMENTS</b>	<b>C) GLOBAL SUSTAINABILITY</b>	<b>Justification</b>
<b>5. Food</b>	<b>5.1)</b> Average dietary composition	No Change is the most similar to BAU	According to the National Food Security Plan, Healthy diets was selected.	Same as NC.	Reference for NC and GS: <a href="#">national food security plan</a> .
	<b>5.2)</b> Share of food consumption which is wasted at household level	No Change was selected.	same as CT.	In order to spare land, reduced waste was selected	-
<b>6. Biofuels</b>	<b>6.1)</b> Targets on biofuel and/or other bioenergy use	No Change.	Same as CT.	Same as CT.	-
	<b>6.2)</b> Targets on other non-food use	No assumptions.	No assumptions.	No assumptions.	-
<b>7. Water</b>	<b>7.1)</b> Irrigated crop area	Low growth to account for BAU (2000-2020) tendency.	Same as CT.	Same as CT.	Reference: <a href="#">Irrigation in Argentina</a> .